

Joint Research Centre

The Nucleonica Gamma Library

presented by Jozsef Zsigrai

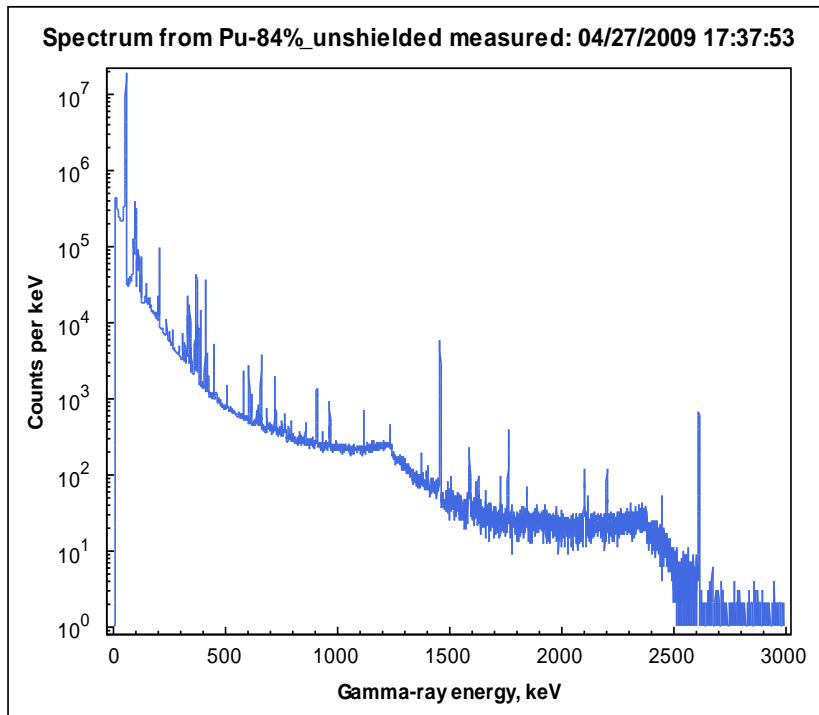
www.jrc.ec.europa.eu

*Serving society
Stimulating innovation
Supporting legislation*



Introduction

- Each gamma-emitting isotope emits photons with a unique set of gamma energies (“gamma signature” or “fingerprint”)

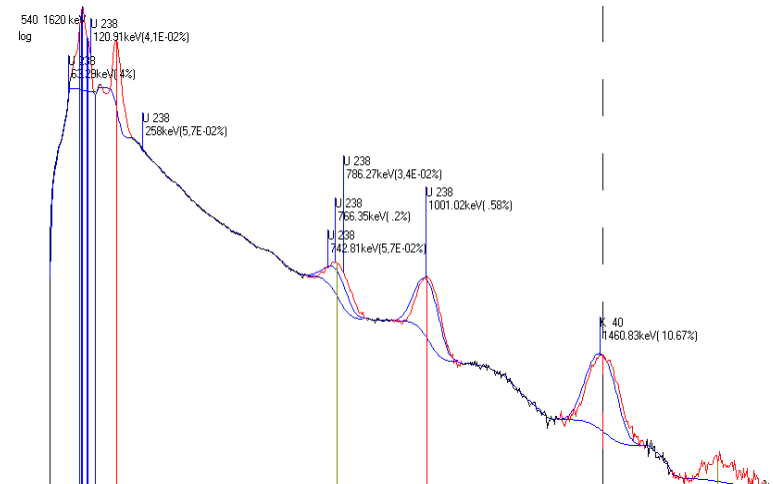


A gamma library is a set of gamma energies with corresponding emission probabilities, emitted by one or more isotopes

Spectrum of Pu, with 84 % of ^{239}Pu





































Introduction

- Various gamma-spectrometric software codes (e.g., ORTEC Gammavision, Canberra Genie2000, WESPA) use libraries to
 - Identify peaks in the spectrum
 - Calibrate the instruments
 - Evaluate the activities of the nuclides
 - Etc.
- The libraries can be created using a range of commercial software, but usually the underlying databases may not be up to date with the most recent nuclear data.

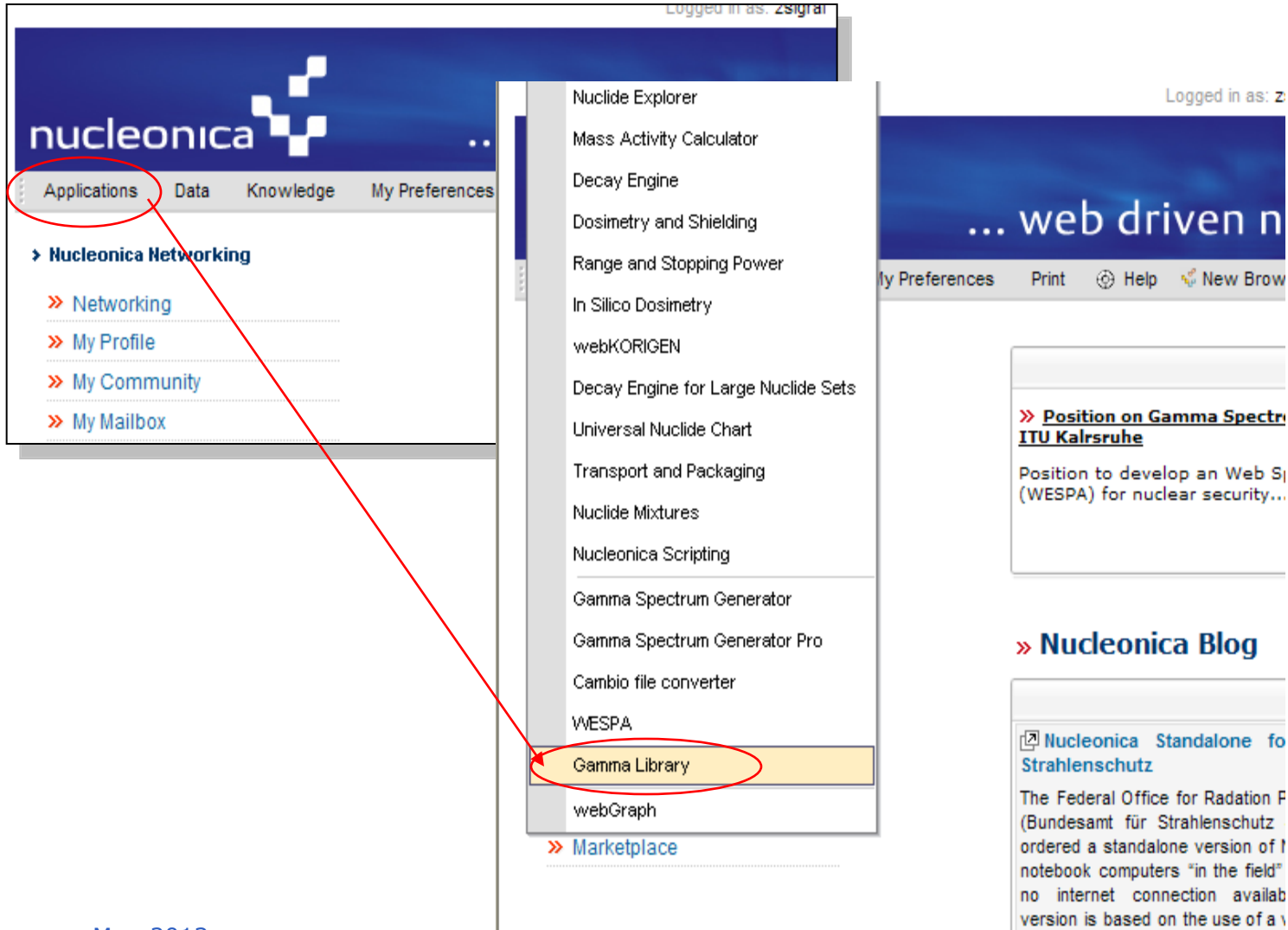


Introduction

- The Nucleonica gamma library module provides a web-based interface for library creation.
- Spectral data can be chosen from the latest internationally evaluated nuclear data in the Nucleonica, 8th Table of Isotopes, or JEFF3.1 databases.
- The libraries created in Nucelonica can be **downloaded to PC** in three formats
 - ORTEC Gammavision
 - Identify (WESPA)
 - Genie2000 (requires converter)

| ID ▲ | Name | Date Modified | Download | Delete |
|---------------|------------------------|----------------------|---|---|
| | (Create a new Library) | | | |
| 22 | Np | 10.05.2011, 09:54:09 |    |  |
| 66 | Calibration Sources | 19.08.2010, 13:13:31 |    |  |
| 67 | Medical Library | 08.07.2010, 16:15:27 |    |  |
| 72 | Background | 11.05.2011, 17:49:10 |    |  |
| 164 | Hein-identification | 17.01.2012, 19:16:20 |    |  |
| 177 | Age-U232 | 19.12.2011, 09:14:19 |    |  |
| 215 | U-age-and-U232 | 19.12.2011, 09:14:34 |    |  |
| 402 | Am to Pu Ratio | 26.07.2012, 13:29:52 |    |  |
| 449 | Np237 in Am | 05.10.2012, 17:20:06 |    |  |
| Total: | 9 | | Page: 1 / 1 | |

Accessing the Gamma Library module



The screenshot displays the Nucleonica web application interface. The top navigation bar includes 'Applications', 'Data', 'Knowledge', and 'My Preferences'. The 'Applications' menu is expanded, showing a list of modules. A red circle highlights the 'Gamma Library' option in this list, with a red arrow pointing to it from the 'Applications' tab. The 'Gamma Library' option is also highlighted with a yellow background. The right sidebar contains a section titled 'Position on Gamma Spectroscopy' and a 'Nucleonica Blog' section.

Logged in as: zsigrai

nucleonica

Applications Data Knowledge My Preferences

» Nucleonica Networking

- » Networking
- » My Profile
- » My Community
- » My Mailbox

Nuclide Explorer

Mass Activity Calculator

Decay Engine

Dosimetry and Shielding

Range and Stopping Power

In Silico Dosimetry

webKORIGEN

Decay Engine for Large Nuclide Sets

Universal Nuclide Chart

Transport and Packaging

Nuclide Mixtures

Nucleonica Scripting

Gamma Spectrum Generator

Gamma Spectrum Generator Pro

Cambio file converter

WESPA

Gamma Library

webGraph

» Marketplace

Logged in as: z

... web driven n

My Preferences Print Help New Brow

» **Position on Gamma Spectroscopy**
ITU Karlsruhe

Position to develop an Web S
(WESPA) for nuclear security...

» **Nucleonica Blog**

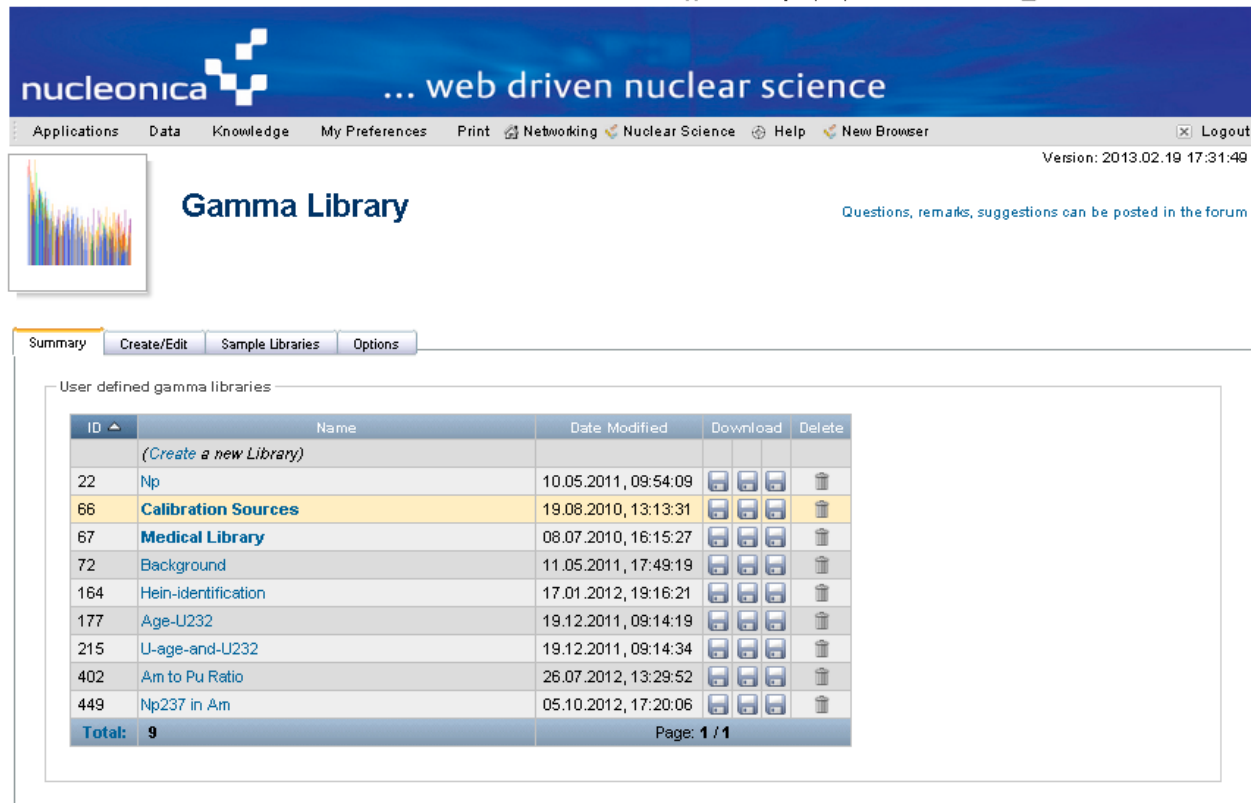
» **Nucleonica Standalone for Strahlenschutz**

The Federal Office for Radiation P
(Bundesamt für Strahlenschutz
ordered a standalone version of I
notebook computers "in the field"
no internet connection availab
version is based on the use of a

May-2013

Welcome to the Library module!

- Create, edit, download, delete your own libraries



The screenshot shows the 'nucleonica' web application interface. The header includes the logo and the tagline '... web driven nuclear science'. A navigation bar contains links for Applications, Data, Knowledge, My Preferences, Print, Networking, Nuclear Science, Help, and New Browser. A 'Logout' button is in the top right corner. The version number 'Version: 2013.02.19 17:31:49' is displayed. The main content area is titled 'Gamma Library' and includes a small thumbnail image of a spectrum. Below the title, there are tabs for 'Summary', 'Create/Edit', 'Sample Libraries', and 'Options'. The 'Summary' tab is active, showing a table of 'User defined gamma libraries'. The table has columns for ID, Name, Date Modified, Download, and Delete. It lists several libraries, including 'Np', 'Calibration Sources', 'Medical Library', 'Background', 'Hein-identification', 'Age-U232', 'U-age-and-U232', 'Am to Pu Ratio', and 'Np237 in Am'. A 'Total: 9' row is at the bottom of the table, and the page number 'Page: 1 / 1' is shown.

| ID | Name | Date Modified | Download | Delete |
|---------------|------------------------|----------------------|----------|--------|
| | (Create a new Library) | | | |
| 22 | Np | 10.05.2011, 09:54:09 | | |
| 66 | Calibration Sources | 19.08.2010, 13:13:31 | | |
| 67 | Medical Library | 08.07.2010, 16:15:27 | | |
| 72 | Background | 11.05.2011, 17:49:19 | | |
| 164 | Hein-identification | 17.01.2012, 19:16:21 | | |
| 177 | Age-U232 | 19.12.2011, 09:14:19 | | |
| 215 | U-age-and-U232 | 19.12.2011, 09:14:34 | | |
| 402 | Am to Pu Ratio | 26.07.2012, 13:29:52 | | |
| 449 | Np237 in Am | 05.10.2012, 17:20:06 | | |
| Total: | 9 | | | |

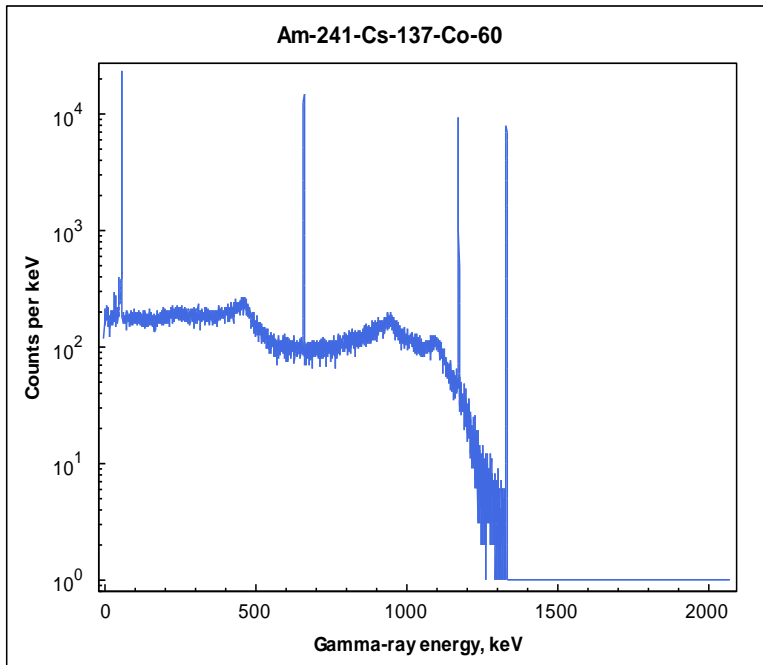
Page: 1 / 1

Example

Let's create a library with two nuclides!

- ^{134}Cs
- ^{137}Cs

(Create a new Library)



May-2013





nucleonica ... web driven nuclear science

Applications Data Knowledge My Preferences Print Help New Browser

Gamma Library

Summary Create/Edit Sample Libraries Options

User defined gamma libraries

| ID | Name | Date Modified | Download | Delete |
|----------|------------------------|----------------------|---|---|
| | (Create a new Library) | | | |
| 8 | Calibration Sources | 19.08.2010, 13:13:31 |  |  |
| 9 | Medical Library | 08.07.2010, 16:15:27 |  |  |
| Total: 2 | | Page: 1 / 1 | | |

Example

Summary

Create/Edit

Sample Libraries

Options

Name: Cs134+Cs137

Description: Test library

Current Chart: Karlsruhe

Cs

134

☒ Consider daughters

Peak Selection

☐ All Peaks

☒ High resolution (HPGe)

☐ Low resolution (NaI)

☐ Deselect all

Emission type

☒ Gamma lines

☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Halflife | Delete |
|-----------|-------------|--------|
| 0 Nuclide | Page: 0 / 0 | |

Daughters from selected Nuclide

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from selected Nuclide

| Energy | Emission Probability | Type |
|------------|----------------------|------|
| 0 / 0 Peak | Page: 0 / 0 | |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------|--------------|----------------------|------|
| Total: | 0 Peak | Page: 0 / 0 | |

Give a name to the library

Enter a description

List of nuclides

Editing area

The created library

May-2013

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs134

2.91 h 2.07 y

Cs

134

☒ Consider daughters

Peak Selection

☐ All Peaks
 ☒ High resolution (HPGe)
 ☐ Low resolution (NaI)
 ☐ Deselect all

Emission type

☒ Gamma lines
 ☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Halflife | Delete |
|-----------|-------------|--------|
| 0 Nuclide | Page: 0 / 0 | |

Radiations from selected Nuclide

| Energy | Emission Probability | Type |
|------------|----------------------|------|
| 0 / 0 Peak | Page: 0 / 0 | |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------------|--------------|----------------------|-------------|
| Total: 0 Peak | | | Page: 0 / 0 |

Daughters from selected Nuclide

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Select a nuclide

Add Nuclide

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs

134

Consider daughters

Cs134

2.91 h

2.07 y

Add Nuclide

Peak Selection

☐ All Peaks
 ☒ High resolution (HPGe)
 ☐ Low resolution (NaI)
 ☐ Deselect all

Emission type

☒ Gamma lines
 ☒ X-Rays

Radiations from the selected nuclide

Nuclide added

Library Nuclides

| Nuclide | Half-life | Delete |
|-----------------------|-----------|--------|
| 55 Cs 134 | 2.0648 y | |
| 1 Nuclide Page: 1 / 1 | | |

Daughters from 55 Cs 134

| Nuclide | Half-life |
|------------------------|-----------|
| 0 Daughter Page: 0 / 0 | |

Click to select/deselect

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |
| 4.47 | 1.44e-3 | X-Ray |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------------------------|--------------|----------------------|------|
| Total: 0 Peak Page: 0 / 0 | | | |

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs134

2.91 h 2.07 y

Cs

134

☒ Consider daughters

Peak Selection

☐ All Peaks
☒ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Half-life | Delete |
|-----------|-------------|--------|
| 55 Cs 134 | 2.0648 y | |
| 1 Nuclide | Page: 1 / 1 | |

Daughters from 55 Cs 134

| Nuclide | Half-life |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |
| 4.47 | 4.44e-3 | X-Ray |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------|--------------|----------------------|-------------|
| Total: | 0 Peak | | Page: 0 / 0 |

⇒

⇐

Click to add selected peaks to library

Example

Summary

Create/Edit

Sample Libraries

Options

Name: Cs134+Cs137
Description: Test library

Current Chart: Karlsruhe

Cs 134
☒ Consider daughters

Peak Selection
☐ All Peaks
☒ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type
☒ Gamma lines
☒ X-Rays

Add Nuclide

Library Nuclides

| Nuclide | Halflife | Delete |
|-----------------------|----------|--------|
| 55 Cs 134 | 2.0648 y | |
| 1 Nuclide Page: 1 / 1 | | |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|------------------------|----------|
| 0 Daughter Page: 0 / 0 | |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |
| 4.47 | 1.141e-3 | X-Ray |
| 242.8 | 2.100e-4 | Gamma |
| 326.5 | 1.400e-4 | Gamma |
| 847 | 3.000e-6 | Gamma |

Save

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

Radiations added to the library

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs134

2.91 h 2.07 y

Cs

134

☒ Consider daughters

Peak Selection

☐ All Peaks
☒ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Half-life | Delete |
|-----------|-------------|--------|
| 55 Cs 134 | 2.0648 y | |
| 1 Nuclide | Page: 1 / 1 | |

Daughters from 55 Cs 134

| Nuclide | Half-life |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |
| 4.47 | 1.44e-3 | X-Ray |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------|--------------|----------------------|-------------|
| Total: | 0 Peak | | Page: 0 / 0 |

Controlled by the options

Default peak selection

Setting the options

Options

HPGe

NaI

Select database

Energy range
(absorbers!)

Emission
probability settings
for default peak
selection

Summary Create/Edit Sample Libraries **Options**

Database: Nucleonica

Min. branching ratio for daughters: 0.01

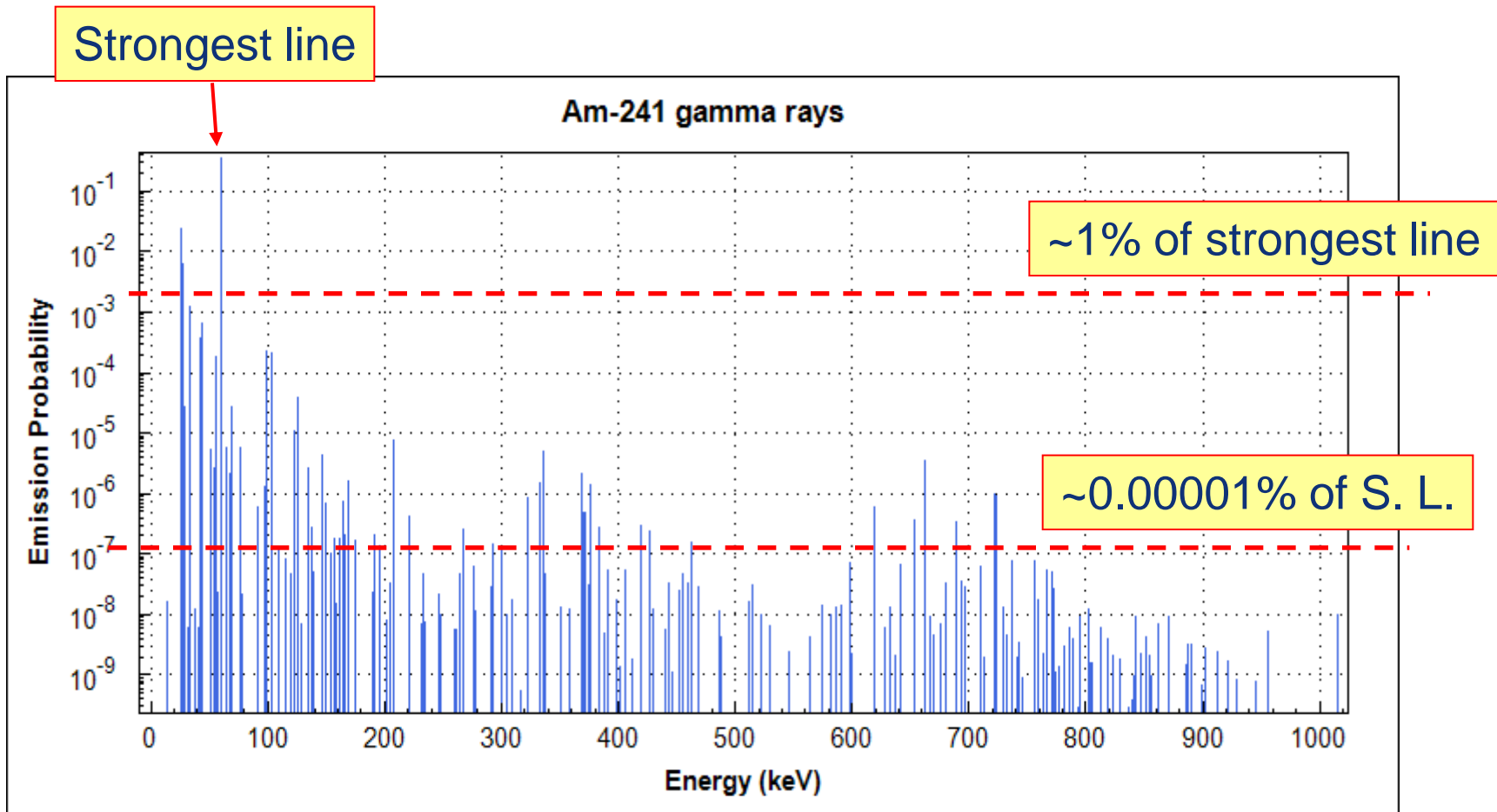
Peak selection: high resolution detectors

| | | |
|---------------------------|------|--|
| Min. Energy | 30 | keV |
| Max. Energy | 3000 | keV |
| Min. Emission probability | 1 | % of E.P. of strongest line |
| Min. Emission probability | 1.5 | % of E.P. of strongest higher energetic line |

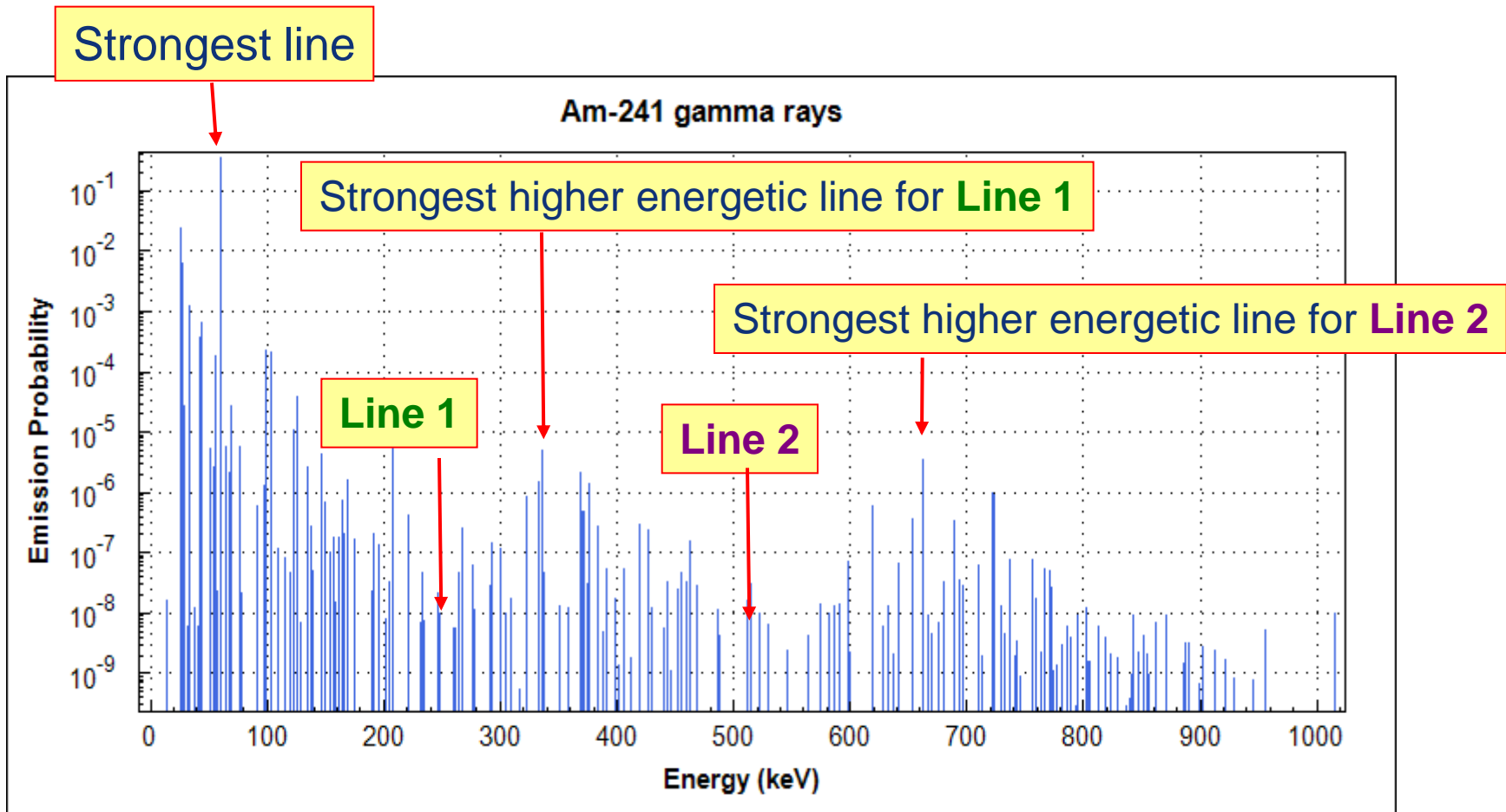
Peak selection: low resolution detectors

| | | |
|---------------------------|------|--|
| Min. Energy | 30 | keV |
| Max. Energy | 3000 | keV |
| Min. Emission probability | 2 | % of E.P. of strongest line |
| Min. Emission probability | 5 | % of E.P. of strongest higher energetic line |

Emission probability settings for default peak selection



Emission probability settings for default peak selection



Example

Summary Create/Edit Sample Libraries Options

Name: Cs134+Cs137

Description: Test library

Current Chart: Karlsruhe

Cs137 30.06 y

Peak Selection

- ☐ All Peaks
- ☐ High resolution (HPGe)
- ☐ Low resolution (NaI)
- ☒ Deselect all

Emission type

- ☒ Gamma lines
- ☒ X-Rays

Consider daughters

Add Nuclide

Add Nuclide

Select next nuclide

Consider daughters

Radiations from selected Nuclide

| Energy | Emission Probability | Type |
|------------|----------------------|------|
| 0 / 0 Peak | | |

Page: 0 / 0

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------------|----------------|----------------------|-------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | |

Page: 1 / 1

Library Nuclides

| Nuclide | Half-life | Delete |
|------------------|-------------|--------|
| 55 Cs 134 | 2.0648 y | |
| 1 Nuclide | Page: 1 / 1 | |

Daughters from 55 Cs 134

| Nuclide | Half-life |
|-------------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Example

Summary

Create/Edit

Sample Libraries

Options

Name: Cs134+Cs137
Description: Test library

Current Chart:
Karlsruhe

Cs137
30.06 y

Add Nuclide

Cs

▼

 137

▼

☒ Consider daughters

Peak Selection
☐ All Peaks
☐ High resolution (HPGe)
☐ Low resolution (NaI)
☒ Deselect all

Emission type
☒ Gamma lines
☒ X-Rays

Save

Library Nuclides

| Nuclide | Half-life | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 2 Nuclides | | Page: 1 / 1 |

Radiations from 55 Cs 137

| Energy | Emission Probability | Type |
|-------------|----------------------|-------|
| 283.5 | 5.800e-6 | Gamma |
| 0 / 1 Peak | | |
| Page: 1 / 1 | | |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | Page: 1 / 1 | |

Daughters from 55 Cs 137

| Nuclide | Half-life |
|-------------|-----------|
| 56 Ba 137m | 2.55 m |
| 1 Daughter | |
| Page: 1 / 1 | |

Cs-137 added

Click to add daughter

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs137

30.06 y

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks
☒ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Ba-137 added

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|--------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |

3 Nuclides

Page: 1 / 1

Daughters from 56 Ba 137m

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from 56 Ba 137m

| Energy | Emission Probability | Type |
|--------|----------------------|-------|
| 661.7 | 0.9007 | Gamma |
| 32.19 | 0.03815 | X-Ray |
| 31.82 | 0.02068 | X-Ray |
| 36.4 | 0.01388 | X-Ray |
| 4.47 | 0.01042 | X-Ray |

4 / 5 Peaks

Page: 1 / 1

Save

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |

Total:

9 Peaks

Page: 1 / 1

Example

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs137

30.06 y

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks
☐ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Save!

Select only one peak for Ba137

Add Nuclide

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Radiations from 56 Ba 137m

| Energy | Emission Probability | Type |
|------------|----------------------|-------------|
| 661.7 | 0.9007 | Gamma |
| 32.19 | 0.03815 | X-Ray |
| 31.82 | 0.02068 | X-Ray |
| 36.4 | 0.01388 | X-Ray |
| 4.47 | 0.01042 | X-Ray |
| 1 / 5 Peak | | Page: 1 / 1 |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

Daughters from 56 Ba 137m

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Click to add selected peak to library

Save

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs137

30.06 y

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks
☒ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|------------|----------|
| 0 Daughter | |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | | |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

List of nuclides

May-2013

Editing area

The created library

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name: Cs134+Cs137

Description: Test library

Current Chart: Karlsruhe

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks

☒ High resolution (HPGe)

☐ Low resolution (NaI)

☐ Deselect all

Emission type

☒ Gamma lines

☒ X-Rays

Cs137

30.06 y

Add Nuclide

1. Select a nuclide (e.g. Cs134)

Save

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|------------|----------|
| 0 Daughter | |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |

⇒

⇐

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

List of nuclides

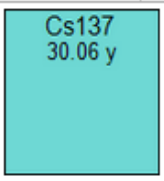
How to remove peaks from the library?

Summary
Create/Edit
Sample Libraries
Options

Name:

Description:

Current Chart:
Karlsruhe



Add Nuclide

Current Chart: Karlsruhe

Cs 137

☒ Consider daughters

Peak Selection

☐ All Peaks

☒ High resolution (HPGe)

☐ Low resolution (NaI)

☐ Deselect all

Emission type

☒ Gamma lines

☒ X-Rays

Library Nuclides

| Nuclide | Half-life | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Daughters from 55 Cs 134

| Nuclide | Half-life |
|------------|-----------|
| 0 Daughter | |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 38.4 | 1.364e-3 | X-Ray |

⇒

⇐

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

Save

Editing area

The created library

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs

137

Consider daughters

Peak Selection

☐ All Peaks
 ☐ High resolution (HPGe)
 ☐ Low resolution (NaI)
 ☐ Deselect all

Emission type

☒ Gamma lines
 ☒ X-Rays

Add Nuclide

Save

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31 | | |
| 36 | | |
| 4.47 | 1.141e-3 | X-Ray |
| 242.5 | 2.100e-4 | Gamma |

Editing area

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs

137

Consider daughters

Peak Selection

☐ All Peaks
☐ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-------------|--------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | Page: 1 / 1 | |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|------------|-------------|
| 0 Daughter | Page: 0 / 0 |

Save

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31 | | |
| 36 | | |
| 4.47 | 1.141e-3 | X-Ray |
| 242.5 | 2.100e-4 | Gamma |

Editing area

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 569.32 | 0.1539 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| 55 Cs 134 | 1.168e+3 | 0.01792 | Gamma |
| 55 Cs 134 | 475.34 | 0.015 | Gamma |
| 55 Cs 134 | 1.039e+3 | 9.910e-3 | Gamma |
| Total: | 9 Peaks | | Page: 1 / 1 |

The created library

4. Copy new peak selection to the library

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs137

30.06 y

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks
☐ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Add Nuclide

Library Nuclides

| Nuclide | Halflife | Delete |
|-------------------|--------------------|--------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | Page: 1 / 1 | |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|-------------------|--------------------|
| 0 Daughter | Page: 0 / 0 |

Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |

Save

⇒

⇐

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|---------------|----------------|----------------------|--------------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| Total: | 5 Peaks | | Page: 1 / 1 |

5. The new selection replaces the old peaks from Cs134 in the library

The created library

How to remove peaks from the library?

Summary

Create/Edit

Sample Libraries

Options

Name:

Cs134+Cs137

Description:

Test library

Current Chart:

Karlsruhe

Cs137

30.06 y

Cs

137

☒ Consider daughters

Peak Selection

☐ All Peaks
☐ High resolution (HPGe)
☐ Low resolution (NaI)
☐ Deselect all

Emission type

☒ Gamma lines
☒ X-Rays

Save

Add Nuclide

Library Nuclides

| Nuclide | Halflife | Delete |
|------------|-----------|-------------|
| 55 Cs 134 | 2.0648 y | |
| 55 Cs 137 | 30.1671 y | |
| 56 Ba 137m | 2.55 m | |
| 3 Nuclides | | Page: 1 / 1 |

Daughters from 55 Cs 134

| Nuclide | Halflife |
|-------------|----------|
| 0 Daughter | |
| Page: 0 / 0 | |


Radiations from 55 Cs 134

| Energy | Emission Probability | Type |
|----------|----------------------|-------|
| 604.69 | 0.9763 | Gamma |
| 795.84 | 0.8552 | Gamma |
| 569.32 | 0.1539 | Gamma |
| 801.93 | 0.08700 | Gamma |
| 563.23 | 0.08380 | Gamma |
| 1.365e+3 | 0.03015 | Gamma |
| 1.168e+3 | 0.01792 | Gamma |
| 475.34 | 0.015 | Gamma |
| 1.039e+3 | 9.910e-3 | Gamma |
| 32.19 | 4.362e-3 | X-Ray |
| 31.82 | 2.364e-3 | X-Ray |
| 36.4 | 1.587e-3 | X-Ray |

Radiation Library

| Nuclide | Energy (keV) | Emission Probability | Type |
|-----------|--------------|----------------------|-------------|
| 55 Cs 134 | 604.69 | 0.9763 | Gamma |
| 55 Cs 134 | 795.84 | 0.8552 | Gamma |
| 55 Cs 134 | 801.93 | 0.08700 | Gamma |
| 55 Cs 134 | 563.23 | 0.08380 | Gamma |
| 55 Cs 134 | 1.365e+3 | 0.03015 | Gamma |
| Total: | 5 Peaks | | Page: 1 / 1 |

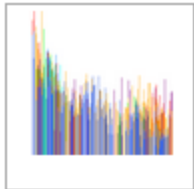
Example



... web driven nuclear science

[Applications](#)
[Data](#)
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[My Preferences](#)
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Version: 2013.02.19 17:31:49



Gamma Library

[Summary](#)
[Create/Edit](#)
[Sample Libraries](#)
[Options](#)

marks, suggestions can be posted in the forum

User defined gamma libraries





































| ID | Name | Date Modified | Download | Delete |
|---------------|--|----------------------|----------|--------|
| | (Create a new Library) | | | |
| 596 | Cs134+ Cs137 | 22.02.2013, 10:38:04 | | |
| 449 | Np237 in Am | 05.10.2012, 17:20:06 | | |
| 402 | Am to Pu Ratio | 26.07.2012, 13:29:52 | | |
| 164 | Hein-identification | 17.01.2012, 19:16:21 | | |
| 215 | U-age-and-U232 | 19.12.2011, 09:14:34 | | |
| 72 | Background | 11.05.2011, 17:49:19 | | |
| 22 | Np | 10.05.2011, 09:54:09 | | |
| 66 | Calibration Sources | 19.08.2010, 13:13:31 | | |
| 67 | Medical Library | 08.07.2010, 16:15:27 | | |
| Total: | 9 | | | |

Page: 1 / 1

Downloading a library

Summary Create/Edit Sample Libraries Options

User defined gamma libraries

| ID | Name | Date Modified | Download | Delete |
|---------------|----------------------------|----------------------|---|---|
| | (Create a new Library) | | | |
| 22 | Np | 10.05.2011, 09:54:09 |    |  |
| 66 | Calibration Sources | 19.08.2010, 13:13:31 |    |  |
| 67 | Medical Library | 08.07.2010, 16:15:27 |    |  |
| 72 | Background | 11.05.2011, 17:49:19 |    |  |
| 164 | Hein-identification | 17.01.2012, 19:16:21 |    |  |
| 177 | Age-U232 | 19.12.2011, 09:14:19 |    |  |
| 215 | U-age-and-U232 | 19.12.2011, 09:14:34 |    |  |
| 402 | Am to Pu Ratio | 26.07.2012, 13:29:52 |    |  |
| 449 | Np237 in Am | 05.10.2012, 17:20:06 |    |  |
| Total: | 9 | | | |

Page: 1 / 1

Download

Formats:

- Gammavision -> Easy
- Identify (WESPA) -> Easy
- Genie2000 -> Requires converter

Making a library for Genie2000

- To use a Nucleonica library with Genie2000, you need to convert it to Genie2000 format
- LibConvert: converter for Genie2000
- Works only if Genie2000 is installed on your system!
- To obtain a copy: write an e-mail to info@nucleonica.com

 LibConvert

Making a library for Genie2000

Summary Create/Edit Sample Libraries Options

User defined gamma libraries

| ID | Name | Date Modified | Download | Delete |
|---------------|----------------------------|----------------------|----------|--------|
| | (Create a new Library) | | | |
| 22 | Np | 10.05.2011, 09:54:09 | | |
| 66 | Calibration Sources | 19.08.2010, 13:13:31 | | |
| 67 | Medical Library | 08.07.2010, 16:15:27 | | |
| 72 | Background | 11.05.2011, 17:49:19 | | |
| 164 | Hein-identification | 17.01.2012, 19:16:21 | | |
| 177 | Age-U232 | 19.12.2011, 09:14:19 | | |
| 215 | U-age-and-U232 | 19.12.2011, 09:14:34 | | |
| 402 | Am to Pu Ratio | 26.07.2012, 13:29:52 | | |
| 449 | Np237 in Am | 05.10.2012, 17:20:06 | | |
| Total: | 9 | | | |

Page: 1 / 1

Download in
intermediate
format for
Genie2000

Save library to your PC then start the LibConvert program

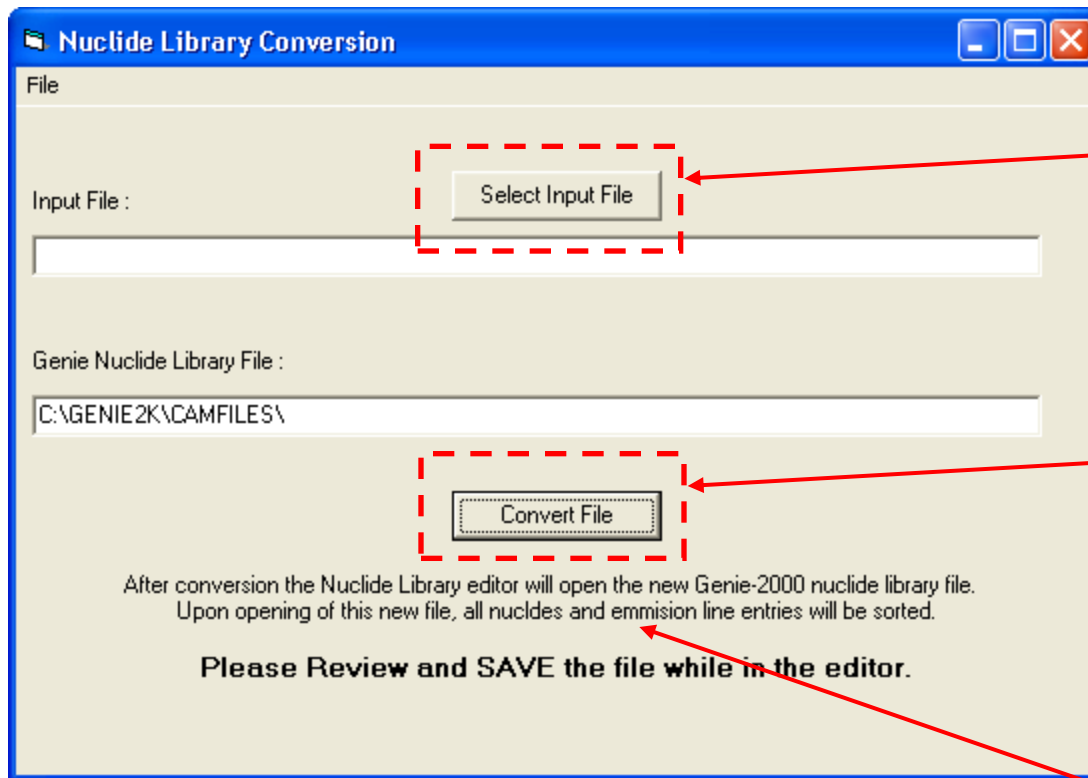


Double-click the LibConvert
executable on your PC

Making a library for Genie2000

LibConvert: converter for Genie2000

 LibConvert



Select Input File

Convert file

Read this!

Making a library for Genie2000

LibConvert: converter for Genie2000



After conversion the Nuclide Library editor will open the new Genie-2000 nuclide library file.
Upon opening of this new file, all nuclides and emission line entries will be sorted.

Please Review and SAVE the file while in the editor.

Making a library for Genie2000

Genie2000 Nuclide Library Editor

Nuclide Library Editor: Genie2000_Np237 in Am.nlb*

File Search Options Help

Nuclide

Name: Half-Life: ☐ Y ☐ D
 Full Name: ☐ H ☐ M
 Type: Uncertainty: ☒ S

Energy Lines

Energy: keV Abundance: % ☐ Key Line
 Uncertainty: keV Uncertainty: Abs ☐ No Wt Mean

| Name | Type | Half Life | Energy - keV | Abundance - % |
|-------|------|-------------|--------------|---------------|
| Pa233 | B- | 2.333e+006S | | |
| | | | 75.28 | 1.3100 |
| | | | 86.59 | 2.0000 |
| | | | 248.30 | 0.0470 |
| | | | 271.48 | 0.3200 |
| | | | 300.12 | 6.6200 |
| | | | 311.98 | 38.6500 |
| | | | 340.54 | 4.5000 |

File: Save

Some good advice:

First look at the spectrum

Then guess which nuclides can be expected

Create a new library and start adding nuclides and energies

For more
info look
at the
Nucleonica
Wiki:



Help



May-2015

Exercise

Create a gamma library for a set of calibration sources, with the energies given below:

^{241}Am

59.54 keV

^{137}Cs ($^{137\text{m}}\text{Ba}$)

661.7 keV

^{60}Co

1173 and 1332 keV